Utilization of grape seed oil and grape seed flour in food industry

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Introduction

- During the red and the white vinification, a large number of by products is produced
- In Greece, it is estimated that the annual production is about **525,000 tons of grapes** which leads to **142,000 tons of winery waste**
- **100 kg fresh marc** are constituted from **30 kg** of fresh **pulp**, **25 kg of fresh seeds** and **20 kg stalks**

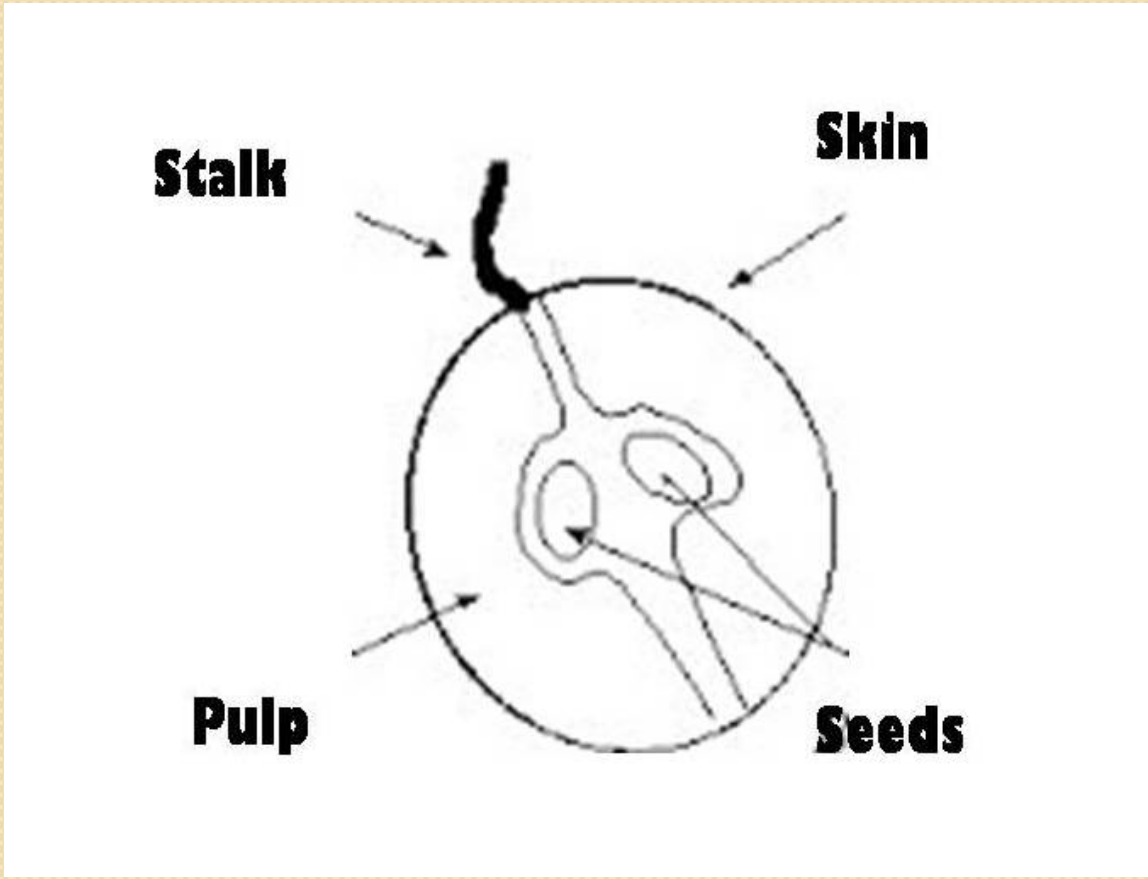
- Recent studies showed that winery by-products may negatively affect the environment by presenting toxicity to crops and wetlands
- Researchs focused on wastewater wineries which were considered responsible for the contamination of groundwater resources

Objectives

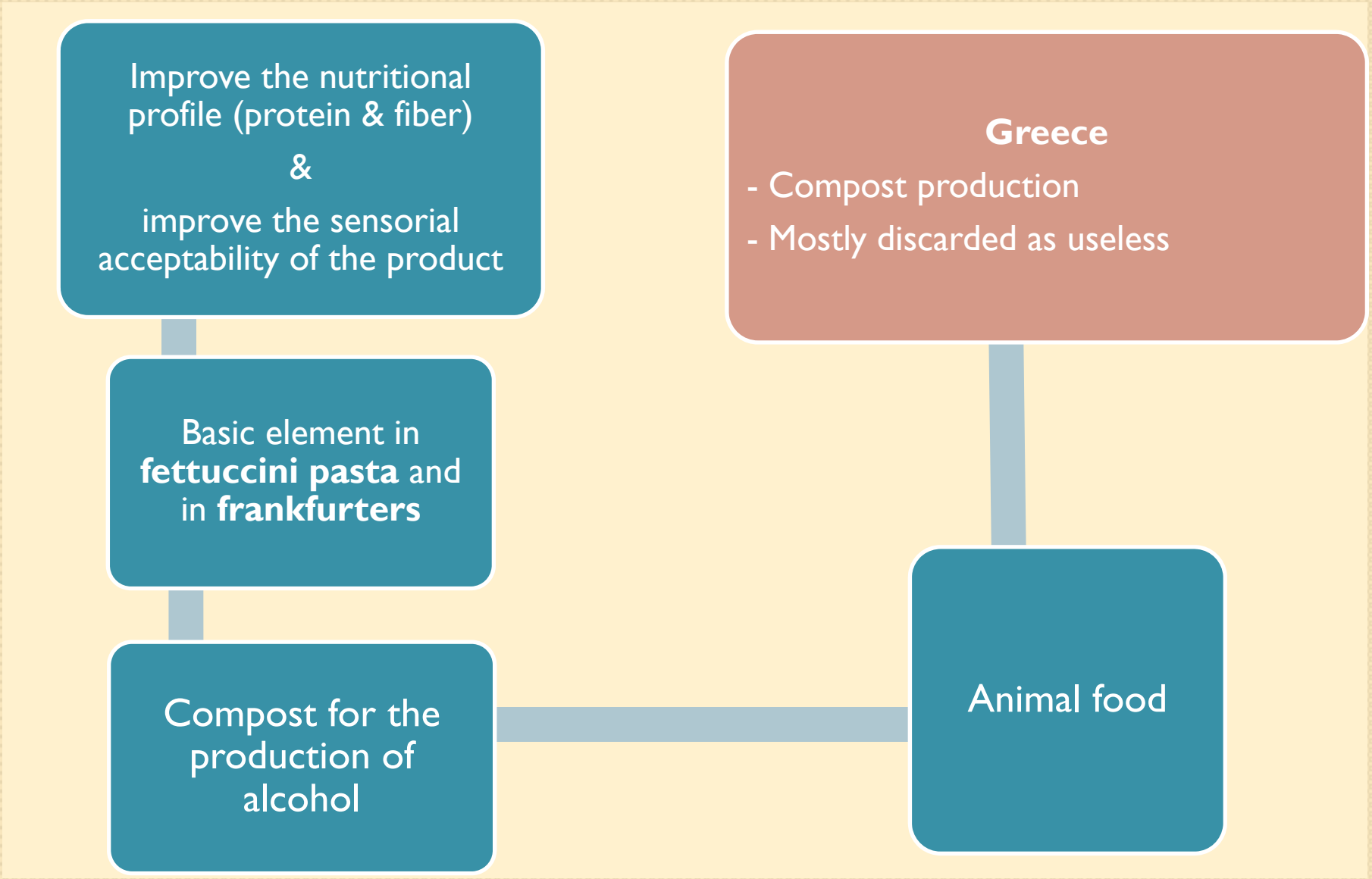
Encourage wineries to apply value adding technologies in order to:

- **Reduce** their waste generation and disposal
- **Provide** further alternatives to diminish the environmental impact of the winery activity
- **Introduce** additional sources of income
- Usage of grape seeds in related products in various factors like **food industry**, **cosmetology**, as well as in **medicine**

Parts of the grape to be used



From grape seeds to grape seed powder



Grape skin & grape seed

- They are the main by-products
- Used: ⇒ produce another product (oil)
  ⇒ compost for the production of alcohol
  ⇒ create a new type of human food

Grape pulp & marc

ulp can be composted after mixing with other minerals and used
fertilizer (France)

rape marc: **fermented** with special crops and produce **high**
dded value and purity substances such as polysaccharide
r produce alcohol

sing the marcs with the composting process; **substrate for plants**
substrate for **cultivation of mushrooms**

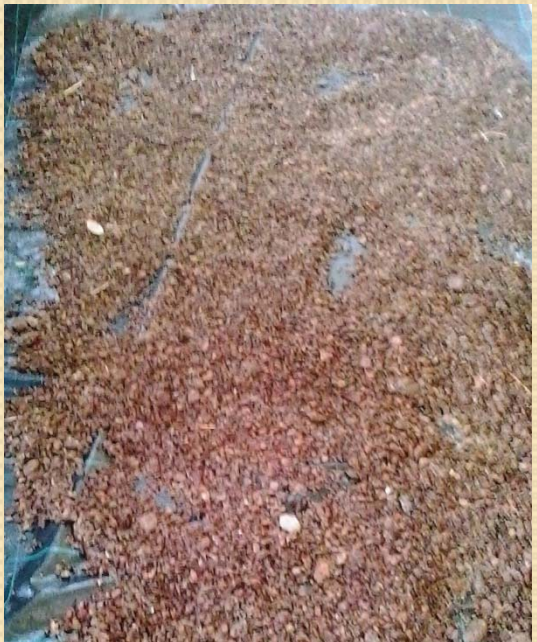
ermentation with different microorganisms & different treatment
ydrolysis or not) ➡ the extraction of tannins & polyphenols

Method & Materials

Grape seed samples

greek grape varieties selected: Mavro Arahovis, avvatiano, Asyrtiko, Malagousia and Roditis

different wineries in Greece



After the harvest, the ressed grapes were dried r 7 days in open air

- They were weighted
- The seeds and skins were selected and separated by hand
- The seeds were stored in glass containers

Grape seed oil extraction & grape seed powder

he production of grape seed oil was done echanically

he safer way as the physical structure of the omponents is maintained

rape seed powder results from the extraction f the grape seed oil

•The oil was extracted with an Italian **electric hydraulic press** OMCN, model 204 / RE with **capacity 150TN**.
•This force was achieved at a pressure of **400 bar hydraulic piston**.
•The amount of seeds for every batch was compressed **0,8lt**.

rape seed oil & grape seed powder analysis

Acidity	Peroxide Value	Moisture & ash
Fat value	Crude fiber	Absorption spectroscopy in 400-800nm
	Determination	


Results

antities of seeds, grape seed oil & grape seed powder

Variety	Net weight of grape seeds (g)	Net weight of grape seed oil (g) Yield (%)	Net weight of grape seed powder (g) Yield (%)
Arahovis	1.518	71 4,6	1.242 81
iano	800	40 5	582 73
ko	1.570	126 8	1.163 74
ousia	2.770	160 5,8	1.556 56

Measurements of grape seed oil & grape seed powder

le	Acidity (%)	Peroxide index (meq/kg)	Moisture %	Ashes %	% Crude fiber	K 270	K 232
.	**1,54**	70	**7,02**	3,2	**48,8**	**1,10**	**3,30**
.	**0,06**	97,5	7,0	3,15	**46**	**0,52**	3,45
R.	0,08	**50**	5,76	**4,01**	47,29	0,83	**3,82**
AG	0,14	100	5,8	**2,82**	48,03	0,87	3,69

Acidity of grape seed oil

avatiano (Domaine Matsa) had the **higher acidity** with
difference from the other samples

Reason: **high pressure** during the extraction (dark oil
olor)

omparing grape seed oil to olive oil: grape seed oil from
lalagouzia grape can be classified as **virgin olive oil** (0.8-
%)

he others (acidity 0,05%-0,2%) can be classified in the
ategory of **extra virgin olive oil**

Peroxide value of grape seed oil

esh olive oil: less than 10 meq O2 /kg

rape seed oil: 50-152,5 meq O2 /kg, ➡ samples have been subjected
chemical oxidation (light, heat, the presence of oxygen and metal
mponents)

n interesting point to be noted is the number of peroxides derived
om the unique red variety of the samples of grape seed oil

avroudi Arachovis peroxide value: 50 meqO2 / kg (the minimum
lue)

his component can be combined with the fact that white wines are
ore sensible to oxidation while red ones show less sensitivity

oisture & ashes in grape seed powder

oisture in grape seed powder samples: 5.6% - 7%

ompared with wheat flour moisture content (11%-14% depending
n the origin) **is much less**

ne moisture content of grape seed powder tends to approach that
f the roast coffee (5%)

shes in grape seed powder samples: 2.8% - 4%

is within the limits given for food (<5%)

Much more than the limits provided for wheat flour and whole
heat flour (1.6%)

igh ash content of grape seed powder = positive parameter

Crude fiber in grape seed powder

6% - 48%

uch higher than 7% which was found in bran sample

mportant feature since it can be used as an ingredient in uman food

he seeds clearly contained more amount of fat relative to grape eed powder, as the second's oil had already been extracted

rape seed oil values obtained from the seeds via Soxhlet ethod and via mechanical pressure differ around **5%.**

y using Soxhlet method we obtained greater quantity of grape eed oil relative to the mechanical method.

Fat determination in seeds and grape seeds powder

e	% quantity of grape seed oil (Soxhlet-Grape seeds)	% quantity of grape seed oil (Soxhlet-Grape seed flour)	% quantity of grape seed oil (mech. extraction)
	10,72	7,7	4,6
.	9,72	7,46	5
R.	8,324	8,22	8

Conclusions

Grape seed oil, produced mechanically is considered to be an advantage for the quality of the product and for that reason

t can be used in food industry

No solvent is used while extracting it

Grape seed powder: valuable as it is rich in crude fibers

The present study demonstrated that grape seed oil and grape seed powder have compounds with beneficial health effect, allowing the valorization of winery by products that are not widely valorized in Greece

Future research

Further analysis

Compare grape seed oil from red and white varieties

Evaluate grape seed oil from different grape varities (aromas/taste)

Usage of grape seeds & grape marcs as nutrient substrate

Thank you for your attention!

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